

Key Evolution In the Fields of Data Analysis and Artificial Intelligence

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ABSTRACT

There is a great deal of complication these days concerning Artificial Intelligence (AI), Artificial Intelligence (ML) and DeepLearning (DL). A computer system able to carry out jobs that typically need human intelligence, such as visual understanding, speech recognition, decision-making, and also translation in between languages. Expert system has actually made it feasible. Deep learning is a subset of artificial intelligence, as well as machine learning is a part of AI, which is an umbrella term for any type of computer program that does something clever. Simply put, all artificial intelligence is AI, yet not all AI is artificial intelligence, and so forth. Machine Learning represents a crucial evolution in the areas of computer science, data analysis, software design, and artificial intelligence. Machine learning (ML) is a vivid area of research study, with a range of amazing areas for additional growth throughout different techniques as well as applications. These locations consist of mathematical interpretability, robustness, personal privacy, justness, inference of origin, human-machine interaction, as well as protection. The goal of ML is never ever to make "ideal" guesses, due to the fact that ML handle domains where there is no such thing. The goal is to make guesses that are good enough to be valuable. Deep learning is a specific type of machine learning that accomplishes great power and also adaptability by learning to stand for the globe as nested pecking order of principles, with each principle specified in connection with simpler principles, and also extra abstract representations calculated in terms of less abstract ones. This paper provides an introduction of artificial intelligence, machine learning & deep learning methods and also contrast these techniques.

Keywords : Artificial Intelligence, Deep Learning, Machine Learning

I. INTRODUCTION

McCarthy, commonly acknowledged as one of the godfathers of Artificial Intelligence (AI), specified it as-- the science as well as engineering of making smart devices. AI is additionally specified as a branch of computer science handling the simulation of smart actions in computers. Machine learning is a branch of expert system that allows computer systems to find out directly from examples, data, as well as experience. Through making it possible for computers to perform particular tasks smartly, machine learning systems can perform complicated procedures by learning from data, instead of following pre-

programmed rules. AI has become part of our imaginations as well as simmering in research laboratories considering that a handful of computer scientists rallied around the term at the Dartmouth Conferences in 1956 and also birthed the area of AI. In the decades given that, AI has actually alternately been heralded as the secret to our world's brightest future, and also threw on technology's garbage load as a harebrained notion of over- getting to prop heads. Honestly, till 2012, it was a little bit of both. Over the past couple of years AI has actually taken off, as well as particularly since 2015. Much of that has to do with the vast availability of GPUs that make parallel handling ever quicker, less expensive, as well as extra

powerful. It also pertains to the synchronised one-two punch of virtually limitless storage space and also a flood of data of every red stripe (that entire Big Data movement)-- pictures, text, purchases, mapping data, you call it. Machine learning is a modern technology that enables computer systems to discover straight from examples and experience in the type of data [1-4] Conventional strategies to shows count on hardcoded regulations, which laid out just how to solve a problem, step-by-step. On the other hand, artificial intelligence systems are established a job, as well as given a huge amount of data to make use of as examples of just how this task can be attained or from which to identify patterns. The system after that finds out just how ideal to achieve the wanted outcome. It can be taken slim AI: machine learning sustains smart systems, which are able to discover a particular feature, offered a details collection of data to learn from [5-8] AI is the all- encompassing umbrella that covers every thing from Great Old Fashion AI (GOF AI) right to connectionist architectures like Deep Learning. ML is a sub-field of AI that covers anything that relates to the research of learning algorithms by training with data. There are whole swaths (not swatches) of strategies that have been established for many years like Linear Regression, K-means, Choice Trees, Random Woodland, PCA, SVM as well as ultimately Artificial Neural Networks (ANN).

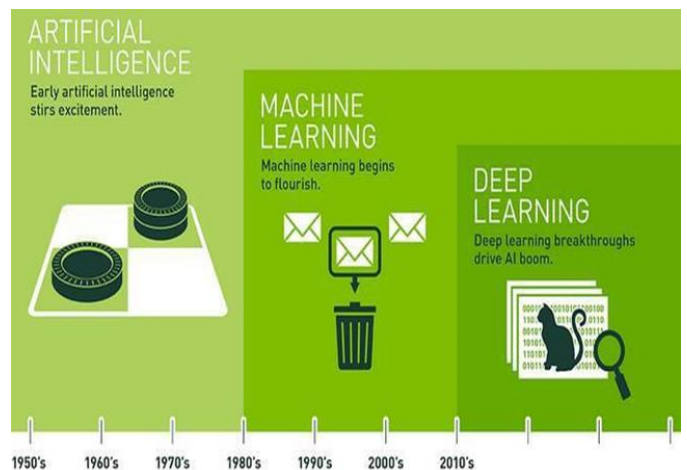


Figure - 1

Artificial Neural Networks is where the area of Deep Learning had its genesis from current years have seen exciting advancements in artificial intelligence, which have increased its capacities throughout a collection of applications. Increasing data availability has actually allowed device learning systems to be educated on a big swimming pool of instances, while increasing computer processing power has sustained the logical abilities of these systems. Within the area itself there have additionally been algorithmic breakthroughs, which have offered equipment learning better power. As an outcome of these advancements, systems which just a few years ago done at noticeably below-human levels can currently out carry out people at some specific tasks. Many individuals currently interact with systems based on machine learning daily, as an example in image recognition systems, such as those utilized on social media sites; voice recognition systems, made use of by virtual personal assistants; as well as recommender systems, such as those used by online sellers. As the field creates even more, artificial intelligence shows assurance of supporting potentially transformative advances in a variety of areas, and also the social and also financial possibilities which adhere to are significant. In healthcare, artificial intelligence is developing systems that can help physicians give more precise or effective diagnoses for sure conditions. In transport, it is sustaining the development of self-governing lorries, and also assisting to make existing

transportation networks extra effective. For public services it has the prospective to target assistance better to those in requirement, or to tailor services to users.

Machine-learning innovation powers numerous facets of modern-day culture: from web searches to material filtering on social web- functions to recommendations on e-commerce web sites, as well as it is progressively existing in consumer items such as electronic cameras and smartphones.

II. MACHINE LEARNING METHODS

Learning in MC includes learning general versions from data, Data is affordable and bountiful, Understanding is pricey and scarce, Customer deals to computer system habits and also construct a design that is an excellent as well as beneficial approximation to the data Tanya et al., International Journal of Advanced Research in Computer Science and also Software Program Design 8(2)

In machine learning, jobs are generally classified right into broad categories. These groups are based on how learning is gotten or just how responses on the learning is provided to the system created. Amongst the different sorts of Artificial intelligence classifications, a critical distinction is drawn in between supervised and also unsupervised learning.

Supervised learning:

The program is-- experienced I on a pre-defined collection of-- training examples I , which after that promote its capability to get to a precise final thought when given brand-new data.

Unsupervised machine learning :

The program is given a bunch of data and must find patterns and relationships therein.

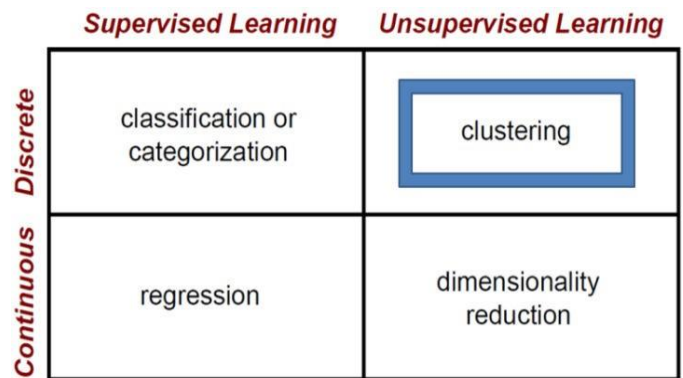


Figure - 2

1) Supervised Machine Learning

In supervised learning, the computer is provided with instance inputs that are identified with their preferred outputs. The function of this approach is for the algorithm to be able to find out by contrasting its real result with the instructed results to find errors, as well as modify the model as necessary. Supervised learning as a result utilizes patterns to anticipate label worths on additional unlabeled data. Most of supervised learning applications, the utmost objective is to create a finely tuned forecaster feature $h(x)$ (in some cases called the theory). Learning

contains making use of sophisticated mathematical formulas to maximize this function to make sure that, provided input data x about a specific domain (say, square video footage of a residence), it will precisely anticipate some intriguing worth $h(x)$ (state, market price for claimed residence). In technique, x usually stands for numerous data points. So, for instance, a housing rate predictor may take not only square-footage (x_1) but additionally variety of bedrooms (x_2), number of restrooms (x_3), number of floorings (x_4), year constructed (x_5), postal code (x_6), and so forth. Establishing which inputs to make use of is an integral part of ML style. Nevertheless, for the sake of description, it is most convenient to think a solitary input value is used.

2) Unsupervised Learning

In unsupervised learning, data is unlabeled, so the learning formula is entrusted to find commonness

amongst its input data. As unlabeled data are a lot more abundant than labeled data, artificial intelligence techniques that facilitate unsupervised learning are specifically useful. The goal of unsupervised learning may be as simple as finding concealed patterns within a dataset, but it might also have an objective of attribute learning, which allows the computational equipment to immediately find these presentations that are needed to identify raw data. Unsupervised learning is typically utilized for transactional data. You may have a large dataset of customers and also their acquisitions, however as a human you will likely not be able to understand what similar qualities can be drawn from customer profiles and their types of purchases. With this data fed into an unsupervised learning algorithm, it might be identified that women of a specific age array who get odorless soaps are most likely to be expectant, and consequently an advertising campaign related to maternity and baby products can be targeted to this audience in order to enhance their number of acquisitions.

Without being informed a proper answer, unsupervised learning techniques can check out intricate data that is more extensive as well as seemingly unrelated in order to arrange it in possibly significant ways. Unsupervised learning is typically utilized for anomaly discovery consisting of for deceptive credit card acquisitions, and also recommender systems that advise what items to purchase next. In unsupervised learning, untagged photos of canines can be made use of as input data for the formula to discover similarities and categorize canine pictures with each other.

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Representation Learning

It is a set of approaches that allows a maker to be fed with raw data and also to immediately uncover the

representations needed for discovery or category. Deep-learning approaches are representation-learning methods with several degrees of depiction, acquired by composing basic however non-linear components that each change the depiction at one degree (beginning with the raw input) right into a depiction at a greater, slightly even more abstract degree. With the composition of adequate such improvements, very complicated functions can be discovered. For classification jobs, greater layers of depiction magnify elements of the input that are necessary for discrimination and also subdue irrelevant variants. A photo, for example, can be found in the form of a range of pixel worths, as well as the learned attributes in the first layer of depiction generally stand for the presence or lack of edges at specific positionings as well as places in the image. The second layer generally detects themes by detecting particular arrangements of sides, regardless of little variations in the edge settings. The 3rd layer might set up concepts right into larger combinations that correspond to parts of familiar objects, as well as subsequent layers would find items as combinations of these parts. The crucial aspect of deep learning is that these layers of features are not made by human engineers: they are picked up from data using a general-purpose learning procedure.

3) Supervised Learning

One of the most typical form of artificial intelligence, deep or otherwise, is supervised learning. Envision that we intend to develop a system that can identify images as containing, claim, a residence, a car, a person or a family pet. We first collect a big data collection of images of homes, autos, individuals and also pet dogs, each identified with its group. During training, the device is revealed an image and generates an outcome in the type of a vector of scores, one for each group. We want the preferred classification to have the highest score of all groups, but this is unlikely to happen prior to training. We compute an unbiased function that measures the mistake (or

distance) in between the result ratings and also the wanted pattern of ratings. The equipment then customizes its inner adjustable specifications to lower this mistake. These flexible specifications, commonly called weights, are actual numbers that can be seen as 'knobs' that specify the input-- result feature of the machine. In a typical deep- learning system, there might be numerous these adjustable weights, as well as thousands of numerous labelled examples with which to educate the maker. To effectively change the weight vector, the learning formula calculates a gradient vector that, for every weight, indicates by what amount the error would increase or lower if the weight were boosted by a small amount. The weight vector is then changed in the opposite direction to the slope vector. A lot of the present practical applications of equipment learning usage linear classifiers on top of hand-engineered functions. A two-class linear classifier calculates a weighted amount of the function vector parts. If the weighted amount is above a threshold, the input is categorized as belonging to a particular group. Since the 1960s we have actually known that direct classifiers can only carve their input area into really easy areas, specifically half-spaces divided by a hyper aircraft. But troubles such as picture and also speech recognition need the input-- result function to be insensitive to unnecessary variations of the input, such as variations ready, orientation or lighting of a things, or variants in the pitch or accent of speech, while being very conscious specific minute variants (for instance, the difference in between a white wolf and a breed of wolf-like white dog called a Samoyed) To make classifiers more powerful, one can use generic non-linear features, similar to bit methods, yet generic attributes such as those arising with the Gaussian kernel do not allow the learner to generalize well much from the training instances. The conventional choice is to hand layout good feature extractors, which calls for a significant amount of engineering skill as well as domain expertise. Yet this can all be stayed clear of if good functions can be learned immediately making use of a

general- purpose learning treatment. This is the crucial advantage of deep learning. We think that deep learning will have a lot more successes in the future because it requires extremely little design by hand, so it can easily capitalize on boosts in the quantity of readily available computation and also data. New learning formulas and also designs that are currently being created for deep neural networks will just increase this development. Deep learning is a really reliable supervised as well as (type of) unsupervised artificial intelligence approach, for certain areas, for example great at unclear acknowledgment of objects/patterns in images. A deep- learning design is a multilayer pile of basic components, all (or most) of which go through learning, and many of which compute non-linear input-- result mappings. Each component in the stack changes its input to increase both the selectivity as well as the invariance of the depiction. With numerous non-linear layers, claim a deepness of 5 to 20, a system can apply exceptionally elaborate functions of its inputs that are at the same time conscious minute information distinguishing Samoyeds from white wolves as well as aloof to huge unimportant variations such as the background, position, lighting and also surrounding objects.

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Back propagation. The back propagation treatment to compute the gradient of an unbiased function relative to the weights of a multilayer stack of modules is absolutely nothing greater than a practical application of the chain regulation for derivatives. The essential insight is that the by-product (or slope) of the goal relative to the input of a component can be computed by functioning backwards from the gradient with respect to the result of that module (or the input of the subsequent module). The back breeding equation can be applied continuously to proliferate gradients with all components, starting from the output on top

(where the network creates its forecast) completely to the base (where the external input is fed). When these slopes have been computed, it is uncomplicated to calculate the gradients relative to the weights of each module. There was, nevertheless, one certain type of deep, feed ahead network that was a lot easier to train and also generalised better than networks with full connectivity between adjacent layers. This was the convolutional semantic network (ConvNet). It achieved lots of functional successes during the duration when neural networks were out of favour.

III. CONVOLUTIONAL NEURAL NETWORKS.

ConvNets are designed to process data that are available in the type of several selections, for instance a colour picture made up of three 2D ranges including pixel strengths in the 3 colour networks. Lots of data modalities are in the form of multiple arrays 1D for signals and also sequences, including language; 2D for pictures or audio spectrograms; and 3D for video or volumetric images. There are four essential suggestions behind ConvNets that benefit from the homes of all-natural signals.

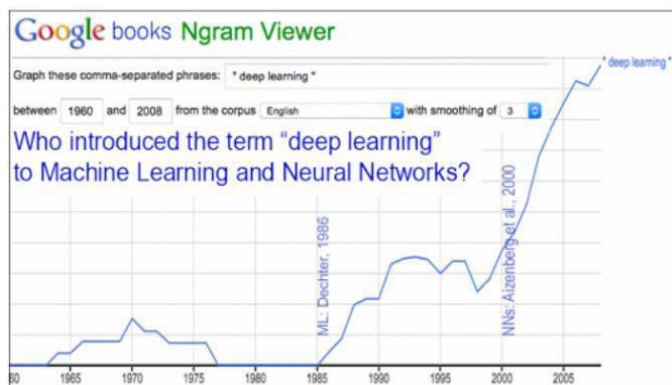


Figure - 3

:neighborhood links, discussed body weights, pooling as well as the use of a lot of layers. Deep Learning, as the condition deep specifies is actually encouraged due to the human brain and also it consists of artificial neural networks (ANN) that are created on a similar design current in the human mind. In Deep Learning,

the learning is conducted with a deep and also multi-layered network of connected neurons. The condition deep typically pertains to the amount of covert coatings in the neural network. According to a Mathwork blog site, traditional semantic networks merely contain 2-3 hidden layers, while deep networks can have as a lot of as 150. In 2006, Geoffrey Hinton created the term deep learning [1] to reveal brand new formulas that make it possible for computer systems to differentiate items as well as text in images and videos. Deep-learning theory reveals that deep internet possess 2 various rapid perks over timeless learning algorithms that carry out not make use of dispersed representations. Both of these conveniences occur coming from the power of make-up as well as rely on the rooting data-generating distribution having a proper componential framework. Initially, learning circulated representations make it possible for induction to new blends of the worths of know attributes beyond those viewed during the course of training (for example, 2^n combinations are actually achievable along with n binary attributes). Second, comprising coatings of depiction in a deep internet takes the possibility for one more exponential perk (exponential in the deepness). The recent excellence of artificial intelligence is obligated to repay no tiny part to the explosion of data that is actually offered in some regions, such as graphic or speech acknowledgment. This data has delivered a vast lot of examples, which artificial intelligence Tanya et cetera, International Diary of Advanced Investigation in Computer Science as well as Software Program Engineering 8(2) systems can utilize to boost their functionality. In turn, machine learning can easily assist deal with the social and economic benefits anticipated from thus- gotten in touch with = significant data', through drawing out useful info through advanced data analytics. Assisting the advancement of the functionality for machine learning needs an amenable data atmosphere, based upon open specifications and structures or even practices to make certain data availability across fields.

As artificial intelligence devices end up being extra ubiquitous, or notable in specific industries, three skills requires observe. To start with, as day-to-day interactions along with artificial intelligence become the standard for lots of people, an essential understanding of making use of data as well as these devices will end up being an important resource needed through individuals of all ages and histories. Offering crucial principles in artificial intelligence at school may help ensure this. Second of all, to ensure that a stable of markets and also careers possess the absorbent capability to use machine learning in manner ins which work for them, brand-new devices are needed to have to create a pool of informed consumers or professionals. Thirdly, further support is needed to create state-of-the-art abilities in artificial intelligence. There is actually presently higher need for people along with innovative capabilities, along with experts in the business being actually extremely searched for, and also extra information to raise this talent swimming pool are critically needed to have. = No regrets' intervene building electronic education and also updated users are going to likewise aid prep the UK for achievable improvements in the employment garden, as the fields of machine learning, artificial intelligence, and also robotics create. There is a huge range of prospective gain from additional uptake of artificial intelligence around industry markets, as well as the financial effects of this technology might participate in a core part in assisting to deal with the UK's efficiency space. Companies of all dimensions around sectors need to have access to appropriate support that aids them to understand the worth of data and also machine learning to their operations. To comply with the need for artificial intelligence all over industry markets, the UK is going to need to have to assist an active maker learning sector, which capitalises on the UK's strength around, as well as its family member international one-upmanships. The UK's start-up atmosphere has nurtured a number of prominent effectiveness stories in artificial intelligence, as well as key factor needs to

be actually given to how to increase the market value of business task in this particular area. The concern of portrayal is located at the heart of the argument between the logic-inspired as well as the neural-network-inspired paradigms for knowledge. In the logic-inspired ideal, an instance of an icon is actually something for which the only residential or commercial property is that it is actually either the same or even non-identical to various other sign instances. It possesses no internal framework that is relevant to its own make use of; and to explanation with signs, they have to be tied to the variables in judiciously picked policies of inference. The number of possible N-grams gets on the purchase of VN, where Vis the lexicon measurements, therefore taking into account a situation of much more than a handful of phrases would certainly need large training corpora. **Recurrent neural networks.** When back propagation was actually first presented, its very most amazing use was actually for instruction recurrent neural networks (RNNs). For activities that include consecutive inputs, such as speech and also language, it is usually much better to utilize RNNs refine an input pattern one component each time, keeping in their surprise devices a „ state vector “ that unconditionally includes info regarding the record of all recent factors of the sequence. When our company take into consideration the outputs of the concealed units at various discrete time steps as if they were actually the results of different nerve cells in a deep multilayer network, it becomes clear exactly how our company may use backpropagation to qualify RNNs.

IV. COMPARISON BETWEEN MACHINE LEARNING AND DEEP LEARNING

Over the years, artificial intelligence has actually progressed in its potential to crisis significant quantities of data and also is largely utilized in everyday uses modern technology. ML energies many aspects of our everyday communication-- from spam filtering to satisfied filtering system on social media

networks, suggestions on ecommerce web sites, and also it is actually significantly found in customer products such as electronic cameras as well as smart phones, the speech acknowledgment (as in Siri, Apple's vocal associate) and handwriting awareness(Ocr device). The primary differences in between Artificial intelligence and also Deep Learning is actually highlighted in adhering to paragraph:

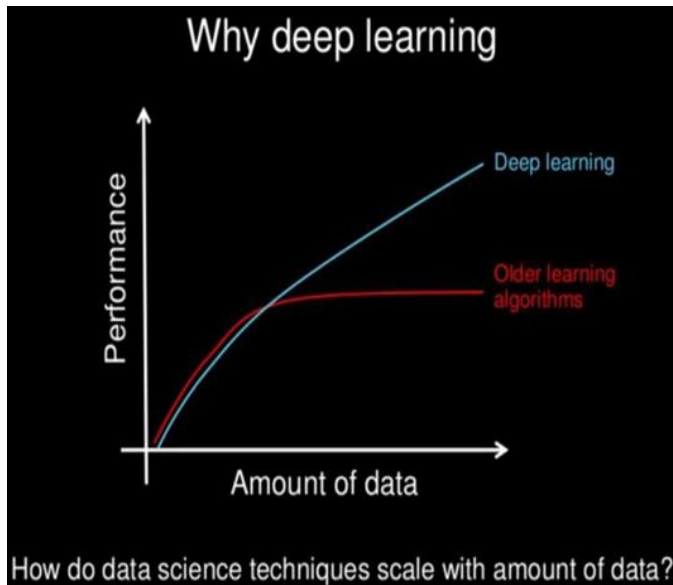


Figure - 4

4) Data dependencies

The functionality of deep learning and also conventional device learning varies dramatically as the scale of data rises. Deep learning algorithms carries out certainly not do that effectively when the data is tiny as its own algorithms require a large volume of data to Tanya et al., International Journal of Advanced Research in Computer Science as well as Program Design 8(2) recognize it completely. In contrary, standard maker learning formulas with their handmade guidelines functions effectively even when data is actually little as displayed in Fig

5) Hardware dependencies

Machine learning algorithms, may function efficiently on low-end devices as they include GPUs which are actually an essential component of its working and also do a big volume of matrix reproduction functions

whereas Deep learning formulas greatly depend upon high-end equipments.

6) Feature extraction

Feature extraction is a process of putting domain name expertise in to the production of component machines to lessen the intricacy of the data and also make styles much more visible to learning protocols to work. This process is actually difficult as well as pricey in regards to opportunity and experience. A lot of the administered features need to have to be identified through a pro and then palm- coded according to the domain name and data type in Artificial intelligence. The attributes can be pixel market values, shape, structures, position and alignment. The functionality of the majority of the Artificial intelligence algorithm depends upon exactly how efficiently the attributes are pinpointed and drawn out. Deep learning formulas extract high-ranking functions from data This is actually primary function of Deep Learning which is actually primary benefit over standard Artificial intelligence. Due to deep learning reduces the task of developing brand-new component extractor for each problem. Numerous developers point out that feature extraction is a painstaking process and relies a whole lot on exactly how informative the developer is. For this reason, for complicated complications such as things acknowledgment or handwriting acknowledgment, feature extraction in typical ML becomes a significant challenge. Alternatively, in Deep Learning, raw data can be supplied by means of neural networks and extract top-level features from the raw data.

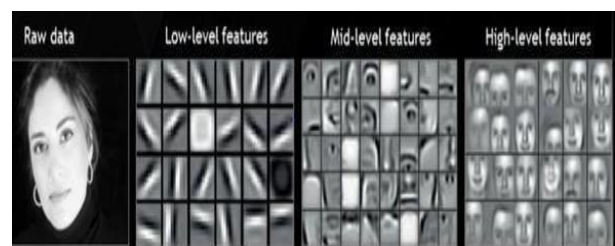


Figure - 5

7) Problem Solving approach

In machine learning algorithm, the problem handling needs to crack the concern down into various components, resolve all of them independently and also integrate all of them to receive the result. Deep learning in contrast addresses the problem end-to-end. Allow our team have a task of various things detection where it is actually to be identified that what is actually the item as well as where is it existing in the In a regular maker learning approach, you would certainly divide the complication right into 2 measures, protest discovery and things appreciation. First, you would use a bounding box discovery protocol like grab reduce, to glance the picture and discover all the feasible things. After that of all the acknowledged objects, you would certainly then utilize object recognition protocol like SVM along with HOG to recognize relevant things whereas in deep learning strategy, end-to-end process is performed. For example, in a YOLO net which is actually a form of deep learning algorithm, when a picture is passed, it would certainly offer the site with the name of things..

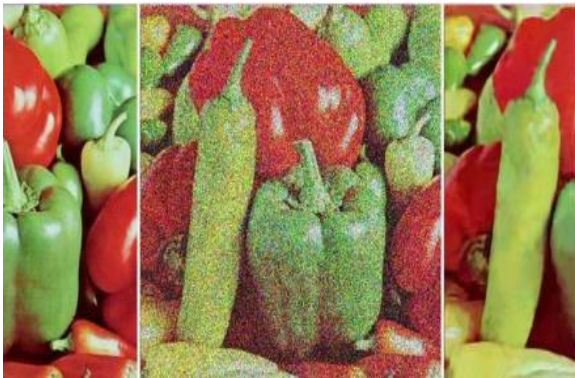


Figure - 6

8) Execution Time

In deep learning algorithm, there are large number of parameters so takes a long time to train. Cutting-edge deep learning formula ResNet takes concerning 2 weeks to train completely for beginners. In contrast, machine learning comparatively takes much less time

to educate, ranging from a couple of seconds to a couple of hrs. The deep learning formula takes much less time to run on testing time. If contrast it with a sort of machine learning formula as k-nearest next-door neighbors, test time increases on increasing the size of data. This is not real for all device learning algorithms, as several of them have small screening times too.

9) Interpretability

Interpretability is an essential element for comparison of artificial intelligence as well as deep learning and also as a result of this factor deep learning is still assumed seriously before its usage in industry. Let us explain by an instance of making use of deep learning to offer computerized scoring to essays. The efficiency it gives in scoring is rather exceptional as well as is near human performance. But It does not disclose why it has actually given that score. Undoubtedly mathematically you can learn which nodes of a deep neural network were turned on, but we don't know what there neurons were intended to design and also what these layers of nerve cells were doing jointly and fall short to translate the results. On the other hand, machine learning formulas like decision trees give us crisp regulations as to why it selected what it choose so it is especially easy to analyze the reasoning behind it.

V. CONCLUSION

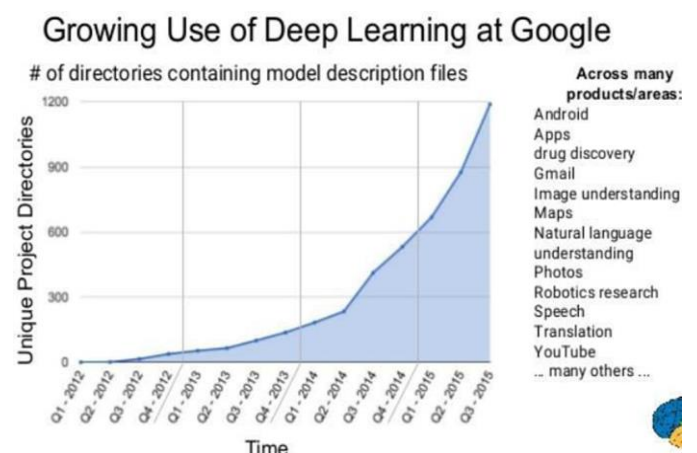


Figure - 7

Artificial intelligence models hit a ground in analytics efficiency as a result of data handling limitations, whereas DL formulas can operate at scale and the current hardware technologies have actually verified exactly how deep learning training can be minimized dramatically to mins. There is a lot a lot more going on in deep learning research study as well as DL is poised to make a significant impact in locations such as driverless modern technology, retail, medical care and its innovations will considerably impact diagnostics. Machine Learning is a technique of training computer systems exactly how to carry out intricate tasks that can not be easily explained or processed by human beings and also to make predictions. It is a mix of Mathematical Optimization as well as Statics. In the other hand, Deep Learning is the subset of ML that concentrate even more directly like nerve cell level to address any kind of trouble.

Eventually, major development in artificial intelligence will certainly come about with systems that incorporate representation learning with complex reasoning. Although deep learning and straightforward reasoning have been utilized for speech as well as handwriting acknowledgment for a long time, brand-new paradigms are needed to replace rule-based control of symbolic expressions by procedures on big vectors.

Research proceeds in Artificial intelligence and also Deep Learning. Yet unlike in previous years, where research was restricted to academic community, research in Artificial intelligence and Deep Learning is exploding in both industry as well as academic community. And also with even more funds readily available than ever, it is more probable to be a keynote in humandevelopment on the whole. General AI is presently difficult and also Narrow AI is extremely difficult. Machine Learning is a way to fix some Narrow AI troubles, albeit with hand-coding entailed. Deep Learning is an improvement on ML, which again

is still Slim AI. Therefore, in the future we might have General AI!

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